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Performing "A New Song": *Suggested Considerations for Drafting Effective Coastal Fisheries Legislation Under Climate Change*

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A B S T R A C T

A New Song for Coastal Fisheries, a strategy and roadmap produced through a participatory workshop facilitated by the Secretariat of the Pacific Community, calls upon Pacific Island Countries and Territories (PICTs) to ensure strong and up-to-date management policy, legislation, and planning for coastal fisheries. While climate change is not a core focus of the roadmap, the call of A New Song presents a unique opportunity to draft new or revised fishery legislation with climate principles in mind. In light of observed and predicted physical, chemical, and biological changes in the region's waters as a result of climate change, climate-ready legislation should promote effective, sustainable management of marine resources to maintain resilience to human and environmental drivers. Recent policy documents—such as A New Song and the FAO's Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries—provide guidance that can direct legislators in this work. This paper distills the guidance from A New Song and the FAO Guidelines into twelve benchmarks and conducts a coarse analysis of how well existing legislation in Pacific Island nations meets these benchmarks. While both A New Song and the FAO Guidelines mention the importance of mitigating and adapting to climate change, they are light on specifics. Considerations specific to climate change and its associated effects should also be incorporated where new or revised legislation is necessary. This paper suggests that to effectively implement the benchmarks of A New Song and the FAO Guidelines under a changing climate, legislation must allow management flexibility in the face of environmental change, ensure that scientific understanding of climate effects supports management decisions, and minimize adverse effects of climate change on the lives, livelihoods, and rights of communities. While acknowledging that most adaptation planning will occur at the scale of sub-national policies, strategies, and plans, this paper focuses on the capacity of new or revised legislation—as called for by A New Song—to affect adaptive capacity in Pacific island coastal fisheries.

1. Introduction

Both off-shore and coastal fisheries provide significant benefits to the citizens of Pacific Island Countries and Territories (PICTs). However, since the formalization of the exclusive economic zone concept under the 1982 United Nations Convention on the Law of the Sea, attention in the region has largely been focused on harnessing the value of off-shore commercial tuna fisheries. It is a strategy that has paid off; these commercial tuna fisheries generate significant government revenue from foreign fishing access fees [1]. In contrast, coastal fisheries have historically received far less attention from government managers, despite the critical role they play in many local communities and their contributions to household income and food security [2]. Unfortunately, several recent studies have highlighted a decline in coastal fisheries resources for many PICTs, caused by a growing population and increased fishing activity [3,4].

Recent initiatives in the Pacific recognize the importance of coastal fisheries and the need to ensure their sustainable management. The 2007 Vava'u Declaration on Pacific Fisheries Resources, "Our Fish, Our Future", commits members of the Pacific Islands Forum Fisheries Agency (FFA)—an inter-governmental organization dedicated to regional capacity building and coordination—to the "development and management of coastal/inshore fisheries and aquaculture to support food security, sustainable livelihoods and economic growth for current and future generations of Pacific people" [5]. The FFA and the Pacific Community subsequently developed the Regional Roadmap for Sustainable Pacific Fisheries [6] which was endorsed by the 46th Pacific Islands Forum in 2015, reaffirming the importance of fisheries [7]. The Roadmap incorporated work led by the FFA on oceanic fisheries, and built on work led by the Pacific Community that developed a new

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strategy for coastal fisheries management: 'A New Song for Coastal Fisheries - Pathways to Change: the Noumea Strategy' (hereinafter A New Song) [4].

A New Song provides a strategy for ensuring the improved well-being of coastal communities and productive and healthy ecosystems and fish stocks [4]. The strategy was endorsed by the Heads of Fisheries of all PICTs and proposed a new vision for coastal fisheries: "sustainable well-managed fisheries, underpinned by community-based approaches that provide food security, and long-term economic, social and ecological benefits to our communities" [4]. A New Song urges PICTs to improve sustainable management of coastal fisheries through legislative action and regulatory implementation, by making strong and up-to-date legislation for coastal fisheries a key outcome area [4]. For most PICTs, this will require new or updated legislation, as past legislative efforts—and subsequent policy making—have generally focused on high value off-shore fisheries, with distinct management and policy issues.

The United Nations Food and Agriculture Organization's (FAO) 2015 Voluntary Guidelines for Securing Sustainable Small Scale Fisheries in the Context of Food Security and Poverty Eradication (hereinafter SSF Guidelines) also recognize a role for coherent national legislation as part of the enabling environment for supporting small-scale fisheries [8]. The SSF Guidelines recognize the rule of law as one of its *Guiding Principles*, requiring parties to adopt "a rules-based approach for small-scale fisheries through laws that are widely publicized in applicable languages, applicable to all, equally enforced and independently adjudicated, and that are consistent with existing obligations under national and international law, and with due regard to voluntary commitments under applicable regional and international instruments" [8].

Both the global SSF Guidelines and the Pacific-focused New Song recognize climate change as an external stressor that will have a significant impact on coastal fisheries [4,8]. The two documents note that climate change will fundamentally alter circumstances and assumptions of the past and that the future of managing fisheries is characterized by uncertainty. The SSF Guidelines strongly urge all states to develop specific policies, strategies, and plans for climate change mitigation and adaptation.

While climate change is a global issue, the character and intensity of climate effects is predicted to be highly region-specific. Fisheries in the southern Pacific region are projected to be some of the most heavily affected by climate change in the world [9,10]. Additionally, even within the southern Pacific region, effects of climate change are expected to vary by place [11]. Changes in the abundance, diversity, and distribution of fish species are all factors that nearshore fisheries managers will have to consider because of direct and indirect climate effects [12–14]. Food security and livelihoods are already a concern in many areas, and are projected to worsen with climate effects to both locally consumed and commercially valuable species [14].

To address the root of these challenges, mitigating action at the international level is essential. Limiting greenhouse gas emissions would have significant benefits for Indo-Pacific fisheries [15]. However, the focal point of this paper is the adaptation to climate change. In the absence of sufficient mitigating action, understanding which species and locations are most sensitive to climate change—and which are most resilient—is essential to minimizing negative social and ecological consequences.

While A New Song recognizes that climate change will affect coastal fisheries, it does not explore how climate should factor into future legislation and decision making for coastal fisheries. In drafting new or updated legislation, increasing resilience of fisheries by meeting the guidelines and recommendations provided by A New Song and the SSF Guidelines is an important first step. To gauge existing implementation of these guidelines, this paper distills twelve key benchmarks from the SSF Guidelines and A New Song and explores the extent to which national legislation in the Pacific currently incorporates them. We then turn to the myriad ways that changing environmental conditions due to climate change may influence the methods and management approaches that can effectively fill the gaps identified. Recognizing the goal of productive and healthy coastal environments and fish stocks that support Pacific island communities in the future, we suggest several ideas for how coastal fisheries legislation can explicitly account for the effects of climate change. We acknowledge that most adaptation planning will occur at the scale of sub-national policies, strategies, and plans, but focus in this paper on the capacity of new or revised legislation—as called for by A New Song (and the overarching Roadmap)—to affect adaptive capacity in PICT fisheries.

2. Methods

2.1. Selecting benchmarks

Benchmarks were selected after a careful analysis of the SSF Guidelines and A New Song. Both policy documents identify several considerations that are regarded as important in either improving the management of coastal fisheries directly or in achieving broader socio-economic goals within the small-scale fisheries sector. For example, A New Song identifies key needs, barriers, and outcomes within a "pathway to change" framework [4]. These considerations were developed and approved by PICT leaders and fishery managers during discussions around sustainable coastal fisheries and a transition to community-based ecosystem approaches to fisheries management. The SSF Guidelines is a lengthier and more formal document with detailed objectives and guiding principles to draw upon [8]. The SSF Guidelines and the concerns they are designed to address are not specific to the Pacific Island context. Thus, some divergence between A New Song and the SSF Guidelines emerged and is noted in Section 3.1.

Both documents were examined to identify requirements which could serve as indicators of the extent to which the objectives of each document were being met. Requirements across both documents were then compared, and a composite list, judged to be broadly representative of both the global guidelines and the regional strategy, was devised. A literature review was conducted to provide a basic cross-check of the utility of the selection. While the selection is necessarily a somewhat imprecise process and focuses on relatively broad principles expressed in general terms, the benchmarks can nevertheless provide a useful starting point for identifying strengths and weaknesses in existing coastal fisheries legislation and considering areas needing improvement. The twelve benchmarks that were derived from this process are outlined in Section 3.1.

2.2. Comparing existing legislation to selected benchmarks

For each of 14 Pacific Island countries,[1] the authors identified legislation expected to affect coastal fisheries management, either directly or indirectly. This includes legislation relating to fishing and marine resource extraction activities, environmental management and protection, traditional tenure and traditional knowledge, and local government and land use. A full list of the laws identified is included as Supplemental Table 2.

Identified legislation was then compared to the selected benchmarks. Electronic keyword searching, supplemented by manual reading, was used to identify provisions within the identified legislation that could support ('yes') or possibly support ('maybe') attainment of one of the identified benchmarks. If no provisions across the identified legislation could be regarded as supporting or potentially supporting

[1] For the purposes of this review, the authors limited their analysis to the 14 independent Pacific Island nations. The nations included in the analysis are Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Marshall Islands, Nauru, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu, and Vanuatu.

the attainment of a benchmark, a 'no' result was recorded for that benchmark in that country. Limitations in this method are recognized. For example, this analysis is based on a paper reading of legislative provisions and requirements and does not attempt to establish if on-the-ground implementation is comprehensive. The authors acknowledge the likelihood of real-world practice diverging from what appears in the statutes. However, an assessment based upon the written law can still provide useful information, if only to pinpoint the implementation of laws as requiring attention rather than the rules themselves. The results of this assessment are included in Sections 3.2 and 4.1 below, with a comprehensive results table in the supplemental materials.

2.3. Developing recommendations for climate change inclusion in coastal fisheries legislation

Expert opinion and literature review informed the development of recommendations. Literature relevant to managing fisheries under climate change was identified by searching several databases. These included the Harold A. Miller Library (Hopkins Marine Station, Stanford University) e-journal database, focusing on marine scientific research and resource management, and the research and publication databases of the Secretariat of the Pacific Regional Environment Programme and Secretariat of the Pacific Community. Using these databases, a search was conducted for papers including both "fisheries" and "climate change" in the title or abstract. Because many studies relevant for analyzing the resilience of fisheries and fishery management approaches to external stressors do not focus on climate change, additional searches with "fisheries management", "access", "resilience", and "environmental variability" were also conducted. Studies considered in this review: (a) focused on the management of fisheries; and (b) addressed some aspect of environmental variability or effort variability. Considerable weight was placed on any study concerning fisheries in developing countries, particularly Pacific Island nations. Personal contact with researchers and consultants in the region also occurred to fill any gaps in the literature review.

While the effects of climate change on marine resources and fisheries are subject to study worldwide, the direct study of how fisheries management approaches fare under changing climate conditions is rare. This is particularly true for small-scale fisheries in the Pacific Islands. However, scientific literature is replete with analysis of the intended and unintended consequences of fisheries management programs. This area of physical and social scientific study is vital to sustainable fisheries management globally and has provided lessons learned in an evolving area of resource management. Areas of study relevant to climate adaptation included those analyzing the extent to which management measures facilitate safety at sea, flexibility to environmental change, and diversification of effort. Existing knowledge of best practices from these areas was evaluated for relevance to climate adaptation and discussed in Section 4.3.

3. Results

3.1. Benchmarks from selected small-scale fisheries policy documents

The SSF Guidelines and A New Song were examined to identify key requirements for the effective management of coastal fisheries and provide benchmarks against which current and proposed legislation can be assessed. Keeping in mind the different emphases of the two documents, areas of divergence are noted. The following list is broadly representative of both the global SSF Guidelines and the regional strategy—A New Song.

3.1.1. Recognition and protection of tenure

Policy documents frame a requirement to recognize and protect traditional marine tenure rights within the sustainable development paradigm. This includes securing equitable and socially and culturally appropriate tenure rights for small-scale fishing communities to the resources that form the basis for their social and cultural well-being and livelihoods. The SSF Guidelines explicitly state that legislation to protect legitimate tenure rights should be provided when necessary [4,8,15].

3.1.2. Recognition and support for local communities and traditional management

A New Song recognizes the importance of supporting people and communities for effective coastal fisheries management. Likewise, the SSF Guidelines acknowledge the role of small-scale fishing communities and indigenous peoples in restoring, conserving, protecting, and co-managing local coastal ecosystems. Recognition and respect for "existing forms of organization, traditional and local knowledge and practices of small-scale fishing communities" are essential for empowering community stewardship. Thus, legislation should facilitate protection of customary rights and support local communities in their traditional practices [4,8].

3.1.3. Long term conservation policies/sustainable management principles

Sustainable, well-managed coastal fisheries that provide food security and long term economic, social, and ecological benefits to communities are the central goal of all fisheries management and are referred to consistently throughout policy documents. Accomplishing this goal requires adoption of measures that ensure the long-term conservation and sustainable use of fisheries resources—the "ecological foundation for food production" [8]. This may include application of the precautionary approach and risk management to guard against undesirable outcomes, such as overexploitation of fishery resources and attendant negative environmental, social, and economic impacts [4,8].

3.1.4. Adequate enforcement mechanisms

Rules-based approaches to small-scale fisheries management are important to ensure that management goals are not undermined by illegal, unreported, or unregulated (IUU) fishing. However, A New Song recognizes compliance, enforcement, and variable or inadequate sanctions as major issues and barriers to effective coastal fisheries management in the Pacific context [4]. Remedying this issue requires stronger enforcement and adjudication mechanisms and allocation of adequate resources, and potentially calls for creative solutions such as community-based enforcement and monitoring to deter, prevent, and eliminate illegal or destructive fishing practices [4,8].

3.1.5. Support for co-management strategies

The development and implementation of effective co-management strategies is a consistent theme in policy documents, which call upon communities and local authorities to work together to provide the most effective inshore coastal fisheries management. Cooperative management approaches require the free exchange of information and knowledge and appropriate support at the regional and national level [4,8]. A central goal of A New Song is to recognize the potential of community-based ecosystem approaches to fisheries management to play a central role in securing the benefits that flow from coastal resources in PICTs and to create an enabling framework that facilitates such an approach [4].

3.1.6. Protection for local workers and immigrant fishing communities

Promotion of social development, employment opportunities, and decent work for all small-scale fisheries communities are crucial to ensuring both quality of life and sustainable exploitation. For example, alternate sources of income can reduce the pressure on coastal fisheries and a diversification of livelihoods can contribute to the longer-term sustainability of coastal communities. Additionally, the need to ensure access rights for subsistence users and protect working conditions of both local communities and migrant workers is a continuing theme of policy documents [8].

Concerns about working conditions and socio-economic support are not central to A New Song because small-scale fishing communities are not marginalized in the Pacific the way they are in other parts of the world [16]. Nevertheless, A New Song recognizes that alternate sources of income may be needed to reduce the pressure on coastal fisheries and that diversification of livelihoods will support fisheries management and contribute to the longer-term sustainability of coastal communities [4]. Additionally, while not explicitly recognized by A New Song, emerging concerns in the region about equitable subsistence access rights for resettled and migrant populations are likely to become more common due to climate change and may require new mechanisms for allocating necessary subsistence access rights [17].

3.1.7. Equity for all stakeholders, both pre- and post-harvest, with a focus on women and children

Engagement of resource users is crucial to ensure long-term success of any management regime. Empowering and motivating communities to engage in decision-making processes and take responsibility for sustainable use of resources is necessary to ensure buy-in and mutual trust between all involved parties [4,8]. This includes facilitating "active, free, effective, meaningful and informed participation" in decision making and ensuring that the full range of perspectives along the fisheries value chain is appropriately represented [8].

The elimination of all types of discrimination and the promotion of justice and fair treatment of all people—in particular, improving age and gender equality and equity—are also stressed in policy guidance documents [4,8]. A New Song notes that the role of women and youth in the fisheries sector is often overlooked or diminished and recognizes the need to support their equitable participation in order to develop the strong, coordinated approach envisaged by the strategy. This includes greater inclusion of women and youth in decision making and more equitable access to the benefits flowing from coastal fisheries [4].

3.1.8. Identification of climate change as a relevant consideration

Global and regional guidance documents identify climate change as a cross-cutting issue that will need to be addressed in coastal fisheries management. The potential for climate change to negatively affect small-scale fishing resources and communities is recognized, highlighting the need for adaptation strategies and building resilience in coastal fishing communities [4,8].

3.1.9. Support for institutional coordination and policy cohesion

Policy coherence, institutional coordination, and collaboration are identified as important factors in creating an enabling environment and supporting the implementation of coastal fisheries management strategies [4,8]. A New Song notes that poor institutional connections at various governance levels have been a key barrier to sustainable management strategies in PICTs [4]. Remedying this issue requires coordination and cooperation between and among communities, fisheries agencies, and stakeholders from a range of other sectors, including health, environment, and agriculture. In addition to coordination of involved parties, there must also be accordance between local, subnational, national, and international laws and policies that address human rights, responsible fisheries, and sustainable development [4,8]. A New Song stresses that successful approaches require stakeholders and policies to "sing in harmony from the same songbook, or risk being ineffective" [4].

3.1.10. Data, research, and information sharing

Collecting data, conducting research, and communicating knowledge and information effectively amongst stakeholders are integral parts of sustainable coastal fisheries management [4,8]. This includes the collection of data relevant to sustainable management of fish stocks and ecosystems, but also to relevant social, cultural, and economic data pertaining to coastal fishing communities. Effective decision making requires the sharing of this information with all interested parties and its use in evidence-based decision making. A New Song emphasizes the need to publicize the already strong body of work on food security needs, past management successes and failures, and the consequences of inaction, and to supplement existing information with further analytical work as necessary [4]. For PICT small-scale fisheries, particular emphasis is placed on traditional and community knowledge, calling for formal recognition and support of the knowledge, culture, traditions, and practices of small-scale fishing communities (including indigenous peoples) in coastal fisheries laws and policies [4,8].

3.1.11. Effective monitoring and evaluative mechanisms

Monitoring and evaluation systems allow institutions to assess progress towards stated goals and objectives. Both guidance documents note that coastal communities and ecosystems are dynamic, and that effective management requires monitoring of progress and identification and remediation of critical issues in a timely manner. While the precise content of monitoring schemes must be context-specific, legislation should ensure management has the ability to evolve to meet emerging challenges and stated objectives using monitoring, evaluation, and adaptation mechanisms [4,8].

3.1.12. Transparent, accountable, and adequately resourced management structures

Long-term success of small-scale fisheries management requires strong administrative mechanisms, supported by adequate resources, formal institutions, and cooperation of all parties. Transparency and accountability are central to the buy-in and trust of resource users, communities, and others involved. Laws, policies, and procedures must be clearly and widely publicized and accessible, and all participants, both government and non-government, must be held accountable for their actions. Adequate resources in the form of staff and funding to support the management process and potential community-level decision-making arrangements are necessary to meet the considerable burden of implementation that falls to national and sub-national governments and agencies [4,8].

3.2. Analysis of national legislation against benchmarks

To facilitate analysis, the authors have identified existing legislation that affects coastal fisheries management in several countries across the region. This includes legislation dealing with fisheries management, environmental protection, local government, and other relevant issues, and is included as Table 2 in the Supplemental Materials. As this table demonstrates, most Pacific Island countries have marine resource and fisheries management legislation currently in place, supplemented by other statutes for the environment and land use that are relevant to coastal fisheries. However, significant shortfalls are identified when the legislation is measured against the benchmark principles distilled from A New Song and the FAO SSF Guidelines.

Table 3 of the Supplemental Materials provides some indication of how legislation from each country reflects the 12 benchmarks. Relevant pieces of legislation for each country were surveyed to identify provisions that could be regarded as supporting each of the 12 benchmarks of effective coastal fisheries management. Legislation was judged against a simple rubric: 'yes' (clear legislative language tending to support attainment of the benchmark); 'no' (legislative language does not clearly support attainment of the benchmark); and 'has potential' (legislative language has potential to support attainment of the benchmark, for example by including it as a relevant consideration in administrative decision-making, but further clarification on how the provision is interpreted or applied is required). The authors acknowledge that this provides only a very coarse level of analysis, however it provides a useful starting point for identifying regional trends. The country-specific data from Supplemental Table 3 is simplified into a higher-level, region-wide summary in Table 1, which demonstrates the number of countries that fell under each category during coarse analysis for each

Table 1
Abbreviated results of the number of countries (out of 14 total) with legislation that meets, has the potential to meet, or does not meet each of the 12 benchmarks. For full, country-specific results, *see* Supplemental Materials Table 3. The nations included in the analysis are Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Marshall Islands, Nauru, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu, and Vanuatu.

	Meets Benchmark	Has Potential	Does Not Meet Benchmark
Recognition and protection of tenure	3	5	6
Recognition and support for local communities and traditional management	9	2	3
Long term conservation policies/sustainable management principles	5	7	2
Adequate enforcement mechanisms	11	3	0
Support for co-management strategies	4	8	2
Protection for local workers and immigrant fishing communities	1	5	8
Equity for all stakeholders (gender and age focus)	5	6	3
Identification of climate change as a relevant consideration	2	1	11
Support for institutional coordination and policy cohesion	6	2	6
Data, research, and information sharing	3	8	3
Effective monitoring and evaluative mechanisms	0	10	4
Transparent, accountable, and adequately resourced management structures	3	8	3

benchmark.

4. Discussion

4.1. Gaps in existing Pacific Island coastal fisheries legislation

Legislative drafting experts widely agree that it is essential to identify the intended legal effect of any new or amending legislation. This requires describing the desired outcome and diagnosing deficiencies in current law. This paper deals with a singular desired outcome: Legislation that is appropriate to Pacific Island coastal fisheries—as called for by A New Song—and responsive to climate change. The deficiencies in existing legislation, however, vary considerably across the region. Some countries have legislation directed at offshore fisheries but only limited, or no, legislative direction for coastal fisheries. Others have legislation directed at coastal fisheries but that legislation is deficient in some key respect(s). The existence of national or subnational coastal fisheries policies also varies widely throughout the region [18]. To draft effective legislation that achieves the desired outcome, each country must identify deficiencies, if any, in current law.

As Table 1 and Supplemental Table 3 demonstrate, some benchmarks from A New Song and the FAO SSF Guidelines are strongly represented in existing legislation. Protection of customary rights and enforcement provisions are frequently included in existing legislation. However, even when the legislative provisions appear strong as written, the authors acknowledge that the implementation of the legislation may be quite different. For example, while on paper the enforcement provisions across Pacific Island countries rate strongly, compliance and enforcement are identified as a significant issue for effective coastal fisheries management in A New Song [4]. In other areas, legislation is generally lacking. Existing legislation frequently lacks protection for fishing communities, support for institutional and policy coordination, and effective monitoring and evaluative mechanisms (see Table 1 and Supplemental Table 3).

Of particular concern—and central relevance to this special issue—is the paucity of reference to climate change as a complicating factor in sustainable management of fisheries. Of the 14 Pacific Island countries surveyed, only Tonga and Tuvalu have direct legislative expressions of the need to implement adaptive action to the effects of climate change. (*See* Tuvalu Environment Protection Act 2008, §§ 29(1)(c-d) and 29(2); Tonga Environment Management Act 2010, §§ 4(g) and 8(1)). Yet even these legislative provisions could be strengthened. Tuvalu's Environment Protection Act mentions adapting fisheries to climate change within the broader need for adaptation across sectors. Thus, implementation of this call for adaptation will depend on prioritization by Tuvalu's Department of the Environment and coordination with the Fisheries Department. Explicit recognition within fisheries legislation (e.g., Tuvalu's Marine Resources Act) would emphasize the need and increase the likelihood of action within the Fisheries Department. Similarly, Tonga's Environment Management Act creates a Ministry of Environment and Climate Change to assist other ministries in adapting their work to the effects of climate change. The Act mentions coastal areas, endangered species, and biodiversity, but says nothing specific about managing the effects of climate change on coastal fisheries. Tonga's Fisheries Management Act 2002 contains no reference to climate adaptation. This level of legislative focus on climate adaptation for fisheries appears broadly in line with global trends, where climate concerns are mainstreamed into general environment and planning laws [19].

4.2. Filling gaps in existing legislation

A New Song calls explicitly for new or revised legislation to fill identified gaps in coastal small-scale fisheries management. The 12 benchmarks distilled from A New Song and the SSF Guidelines can steer this process, as they are designed to facilitate effective and sustainable management of small-scale fisheries. Each of the benchmarks is a crucial goal for successful small-scale fisheries management and the achievement of each requires strong legislative support. As Pacific Island nations begin implementing the recommendations of A New Song, these challenges could be addressed via legislation in the coming years. For example, legislation can ensure ecological sustainability by requiring the collection of key information for evidence-based decision making. Similarly, statutory provisions can include goals of social, cultural, and economic sustainability and require that the management scheme account for and protect current and future user interests. Perhaps most importantly, new administrative structures and funding appropriations via statute can guarantee the long-term viability of decision-making structures and ensure that institutional knowledge and capacity increase over time. National and regional support for co-management strategies are strongly encouraged throughout the region [4,8].

4.3. Accounting for the effects of climate change in new or revised coastal fisheries legislation

The best approach for climate adaptation is ensuring a functioning management system. Addressing many of the aforementioned gaps in implementation will strengthen the resilience of fisheries to climate change, as well as to other environmental and social challenges. Preventing overfishing, addressing IUU fishing, protecting user rights and ensuring robust livelihoods, and providing administrative support for managing fisheries are essential considerations for effective fisheries management under all circumstances [4,8]. These considerations are an essential pre-requisite for adapting to a changing climate and have the potential to reduce harmful effects of changing environmental

conditions on fisheries around the world. Nevertheless, climate change may influence the methods or approaches that could effectively address the gaps this paper identifies and presents specific new challenges that deserve special attention. In undertaking future legislative efforts to address coastal fisheries, adapting fisheries to climate change must be elevated as a core consideration. Thus, we now present additional considerations for climate-ready legislation not addressed in A New Song or the SSF Guidelines.

Generally, legislation can best serve the goals of climate adaptation by exploring policies that facilitate community transition through difficulties. These may include outlining management approaches for emerging fisheries, creating an integrated management framework that allows and accounts for flexibility of effort and changing pressures, developing disaster preparedness and response standards, or facilitating management measures that account for the climate response of different species or communities. This section explores several important considerations that lawmakers should recognize and incorporate into new or revised legislation to ensure effective small-scale fisheries management under a changing climate. Importantly, many of these measures are considered "no regrets" approaches and will benefit small-scale fishing communities under all future scenarios of climate effects. References to benchmarks that each consideration is necessary to effectively address are included in parentheses.

4.3.1. Facilitate diversification of effort

Climate effects are expected to vary by location and by species, depending on exposure and sensitivity to environmental changes. Some locations or species will see increases in productivity and positive health trends while others suffer. If a legislative framework enshrines any management methods that set aside certain areas or measures to individuals or fishing communities, the management scheme may cause some communities to suffer while others thrive. Those fishermen and women with recognized rights in negatively affected resources will be locked into fishing for a declining resource. Any continuing harvest will harm both the species and the fishing community through overfishing and the decreasing potential value of allocated resources. To avoid this pitfall, supportive coastal fisheries legislation should be drafted in a way that supports management flexibility in utilization of coastal fisheries resources. (Benchmarks 2 – supporting communities; 3 – ecological sustainability; 6 – protection for fishermen and communities; 8 – climate change).

A variety of methods for limiting effort to ensure sustainability have been introduced around the world, including gear restrictions, spatial fishing privileges, and limited access programs [20]. Some of these approaches exhibit characteristics that may inhibit diversification of effort. For example, some management mechanisms have the potential to lock fishermen into a specific territory or fishery, creating vulnerability when external shocks (e.g., due to climate variability or fluctuating markets) alter the viability of the fishery location or target species. Conversely, allowing shifting effort between multiple species and locations could provide flexibility in terms of when, where, and how much is harvested as the productivity and distribution of different species changes [21]. Such a system could be effective at balancing the need to sustain fishing livelihoods with the sustainability of fish populations. However, this type of flexible approach to shifting effort may not be feasible or appropriate in areas where coastal and small-scale fishing privileges are primarily rooted in customary tenure [22]. Within this context, discrepancies between traditional tenure and state ownership and management of resources must be addressed. (Benchmarks 1 – tenure; 2 – supporting communities; 9 – institutional cohesion). Yet in all cases, the potential for top-down fisheries management systems to inhibit flexibility should be considered and avoided.

Extending this concept further, as species undergo climate-induced range shifts, some species will expand their range to new areas or completely shift to a new range. To contend with this, legislation can outline a plan specific to identifying and managing disappearing fisheries, emerging fisheries, and new invasive species across the management zone. Facilitating transitioning effort between fisheries may also be critical to the successful management of resources and resource users. Legislation could, for example, support gear transfer programs between communities or islands, limit effort while emerging stocks establish themselves, or supply investments in new fisheries for emerging species that are deemed invasive [23].

Nearshore fish aggregation devices (FADs) are an example strategy currently suggested for use in Pacific Islands as a method for shifting effort and protecting livelihoods and food security [24]. Where FADs are desired, key legislative considerations will be allocation of funding for FADs and determining ownership and stewardship responsibilities for national governments or local communities. Factors that may affect assigned responsibilities and funding sources include the location of FADs (e.g., in community tenure areas or areas of national jurisdiction), the purpose of the FAD (e.g., shift effort away from coral reef fish or other ecosystems affected by climate change, increase catch, or economic development), and the capacity of entities to steward and protect the fish and FAD resource. (Benchmarks 3 – ecological sustainability; 5 – co-management; 12 – management structures).

4.3.2. Base decisions on up-to-date information and require adaptive management

Legislation should avoid any mechanisms that rigidly rely on past assumptions of stable or predictable environmental conditions. For example, basing management decisions on historical averages of abundance or catch will result in failure to consider the changes predicted for fisheries in the region. Relevant and timely information becomes crucial under climate change, as adaptation of fisheries requires information on how marine species and resource users will respond to environmental change. Recognizing that many Pacific Island communities currently lack sophisticated information relating to species abundance or productivity, legislation should focus on capacity building and adaptive management [25].

Building community capacity to gather information is necessary to facilitate evidence-based management decisions. Innovative ways to gather the knowledge necessary to understand climate impacts could be explored; for example, capitalizing on regional progress towards co-management by leveraging traditional ecological knowledge and citizen science [26]. These methods can be an effective and low cost way to collect information from multiple sites, with the added benefit of raising awareness and engaging communities in the information collection process and thereby supporting well-informed community-level decision making. (Benchmarks 5 – co-management; 10 – data and research; 11 – monitoring mechanisms; 12 – management structures)

Lawmakers can also outline how decision-making processes should utilize this gathered information. As part of any small-scale fishery decision-making process, legislation should call upon managers to assess the vulnerability of individual species and communities to climate change and to use this assessment in determining research and management priorities [14]. It may also be beneficial to consider adaptive management approaches that facilitate information collection while ensuring management is not postponed [25]. Legislation can accomplish this by prioritizing information collection and precaution for low-information fisheries and emerging fisheries [27]. Management of information-rich species can rely more heavily on evidence-based management measures derived from previously collected information. Embedding a requirement of adaptive management into these approaches can enable managers and communities to revise management efforts as necessary to improve outcomes or as new information is gathered [25]. Statutory frameworks can also create early warning systems by providing funding and institutional support for ecological monitoring programs that track chemical and physical changes in coastal waters and study their importance as drivers of change [28]. In some areas, informal monitoring and understanding of environmental drivers that would benefit from institutional support may already exist at the

community level. (Benchmarks 3 – ecological sustainability; 8 – climate change; 10 – data and research; 11 – monitoring mechanisms; 12 – management structures).

4.3.3. Where marine protected areas are desired, consider connectivity and dynamic boundaries

Where protected areas are utilized, legislation should facilitate dynamic boundaries and flexibility to environmental change. Because distribution shifts of important species are expected to occur, static protected areas may prove less effective in the future. Creating corridors that mirror expected distribution shifts will facilitate range shifts in response to environmental change [29–31]. Connecting protected areas can also increase resilience to storm surges and mass bleaching events that are likely to become increasingly common [29–31]. Legislation should recognize these issues and explore methods for creating spatial management strategies that are dynamic to changing circumstances. (Benchmarks 3 – ecological sustainability; 8 – climate change).

4.3.4. Require consideration of the cumulative effects of climate change

Ensuring long-term food security and sustained livelihoods requires consideration of the direct and indirect effects of climate change on fishery resources and resource users, in conjunction with other effects. Many existing impact assessment programs already require analysis of the effects of land use, coastal development, and marine resource use on coastal fisheries and fishing communities [32,33]. A strong legislative framework could add to this by recognizing that sea level rise, drought, intensified storms, and other climate change induced phenomena negatively affect fishery resources and communities, provide for impact assessments, and grant resource users a stake in decisions that would impact coastal environments. Lawmakers may be able to accomplish this by explicitly outlining changes to an existing environmental impact assessment scheme that is specific to project impacts on coastal small-scale fisheries. If an impact assessment scheme does not currently exist, legislation can promote an integrated approach to management of all human activities that affect coastal fisheries, both fishing and non-fishing. This will ensure a more holistic management approach to the suite of stressors that affect the sustainability of coastal fisheries and communities. (Benchmarks 3 – ecological sustainability; 6 – protection for fishermen and communities; 8 – climate change; 10 – data and research)

4.3.5. Expand the livelihoods of fishing communities

Coastal fisheries in Pacific Island nations are a primary source of protein and essential to culture and livelihoods of citizens. As a result, the sustainability of communities that rely on coastal fisheries is central to the goal of effectively managed coastal fisheries. A New Song and the SSF Guidelines both recognize that successful management must protect the lives, livelihoods, and rights of resource users—both traditional and contemporary [4,8]. Thus, legislation should facilitate understanding of the user groups involved in coastal fisheries, their reliance on fishing for food security and livelihoods, and their capacity to adapt to changing circumstances. Where communities are reliant on species that may experience adverse effects—particularly those that are already over-exploited—livelihood diversification is an essential adaptation measure. Legislation can facilitate diversification by creating opportunities in ecotourism, aquaculture, or more local post-harvest processing [13]. Protecting livelihoods may also necessitate continuing to ensure local and small-scale fishing activity preference over foreign fishing and ensuring that conflicts with more politically powerful sectors are resolved equitably. Outside of the fisheries sector, Pacific Island nations should facilitate integration across sectors, ensuring that other sectors of government account for impending difficulties in coastal communities. (Benchmarks 2 – supporting communities; 3 – ecological sustainability; 6 – protection for fishermen and communities; 7 – equity; 9 – institutional cohesion).

4.3.6. Protect the lives of fishermen and women

As climate change brings more severe weather patterns and fishermen and women are forced to travel farther to find their usual catch, fishing safety will become of increasing concern [23,34]. Legislation should therefore require that decisionmakers consider fishing safety when assessing management alternatives and discourage management approaches with demonstrated safety concerns. For example, legislation should avoid a race-to-fish mentality that is common to quota fisheries and seasonal management. Without proper safeguards, this type of management has been shown to encourage short-term catch maximization, at the expense of safety and long-term sustainability [35]. Legislation can also protect fishermen and women via the creation of early warning systems, risk awareness programs, safety training protocols, and disaster response standards [13,34]. Best practices may be easily identified by consulting the international labor standards and minimum working conditions outlined by the FAO, International Maritime Organization, and International Labor Organization [36,37]. (Benchmarks 2 – supporting communities; 6 – protection for fishermen and communities; 7 – equity; 9 – institutional cohesion).

4.3.7. Facilitate community-level ownership of the adaptation process

While lawmakers can incorporate many climate considerations at the legislative level, many concerns will need to be addressed at the implementation stage. By providing funding and capacity building for community-level adaptation planning, legislation can enable fishing communities to take ownership over resource management activities and the complex tradeoffs and decisions that are likely to arise due to environmental changes and new legislative requirements. Adequate appropriations and support should be provided for necessary updates and revisions to adaptation strategies as well, as uncertainty is typical in current projections and predictions of climate effects. However, encouraging decision processes that are explicitly designed to respond to changing climate conditions could reduce the need for repetitive, cost-intensive group discussions. (Benchmarks – 2 – supporting communities; 5 – co-management; 6 – protection for fishermen and communities; 7 – equity; 8 – climate change 11 – monitoring mechanisms; 12 – management structures).

5. Conclusion

Climate change presents numerous challenges for the effective management of coastal small-scale fisheries throughout the Pacific. A New Song and the FAO SSF Guidelines will provide a catalyst for many PICTs to review their legislative frameworks for coastal fisheries and thus presents an opportunity to ensure that coastal fisheries management in the region is also climate-ready. An important first step is improving the resilience and adaptive capacity of coastal fisheries by ensuring consistency with the high-level suggestions and consensus best practices identified in A New Song and the SSF Guidelines. Our coarse analysis demonstrates that national legislation across the region requires strengthening to meet these best practices for coastal fisheries.

The creation or amendment of legislation over the coming years to fill these gaps also presents an opportunity to proactively plan for the emerging threat of climate change. The core recommendations of this paper are to discuss how legislation can limit or facilitate adaptive capacity in the legislative development process and to favor the latter when possible. More specifically, the analysis suggests that legislation could support effective coastal fisheries management in this dynamic environment by facilitating diversification of effort, building capacity to gather timely data, and supporting adaptive management.

This paper intends to raise some ideas and begin a conversation, but recognizes the lack of easy answers for how to address climate change effects on coastal small-scale fisheries through legislation. An important component of crafting new legislation will be striking the appropriate balance between state-driven management efforts and bottom-up community stewardship. Legislating for adaptation to climate change in

small-scale fisheries is entering uncharted waters and we stop short of recommending specific action, as any given legislative provision may not be appropriate to the context of individual Pacific Island nations. Nevertheless, the question of how climate change will affect marine resources and resource users must be a core consideration for all future policy endeavors.

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Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at http://dx.doi.org/10.1016/j.marpol.2017.06.012.

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